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(54) **SUCTION BRUSH ASSEMBLY HAVING ROTATION ROLLER FOR SWEEPING DUST**

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(57) **ABSTRACT**

A suction brush assembly of a vacuum cleaner has a housing having a suction duct to provide a suction passage for dust, a rotation roller having a plurality of ribs formed at an outer circumference, a wheel disposed at the housing, and a power transmission unit to rotate the rotation member by exerting a rotation force of the wheel to the rotation member when the wheel is rotated. The wheel and the rotation member are rotated in directions opposite to each other by the power transmission unit. When a user wants to clean fabrics such as bedclothes or a carpet, the effect of hitting of the ribs can be firmly secured due to the rotation of the rotation rollers. Therefore, the effect of removing dust remarkably increases.

24 Claims, 4 Drawing Sheets

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(52) **U.S. Cl.** **15/388; 15/48.1; 15/384**

(58) **Field of Search** 15/27, 41.1, 48.1,
15/52.1, 98, 383, 384, 388, 389, 377

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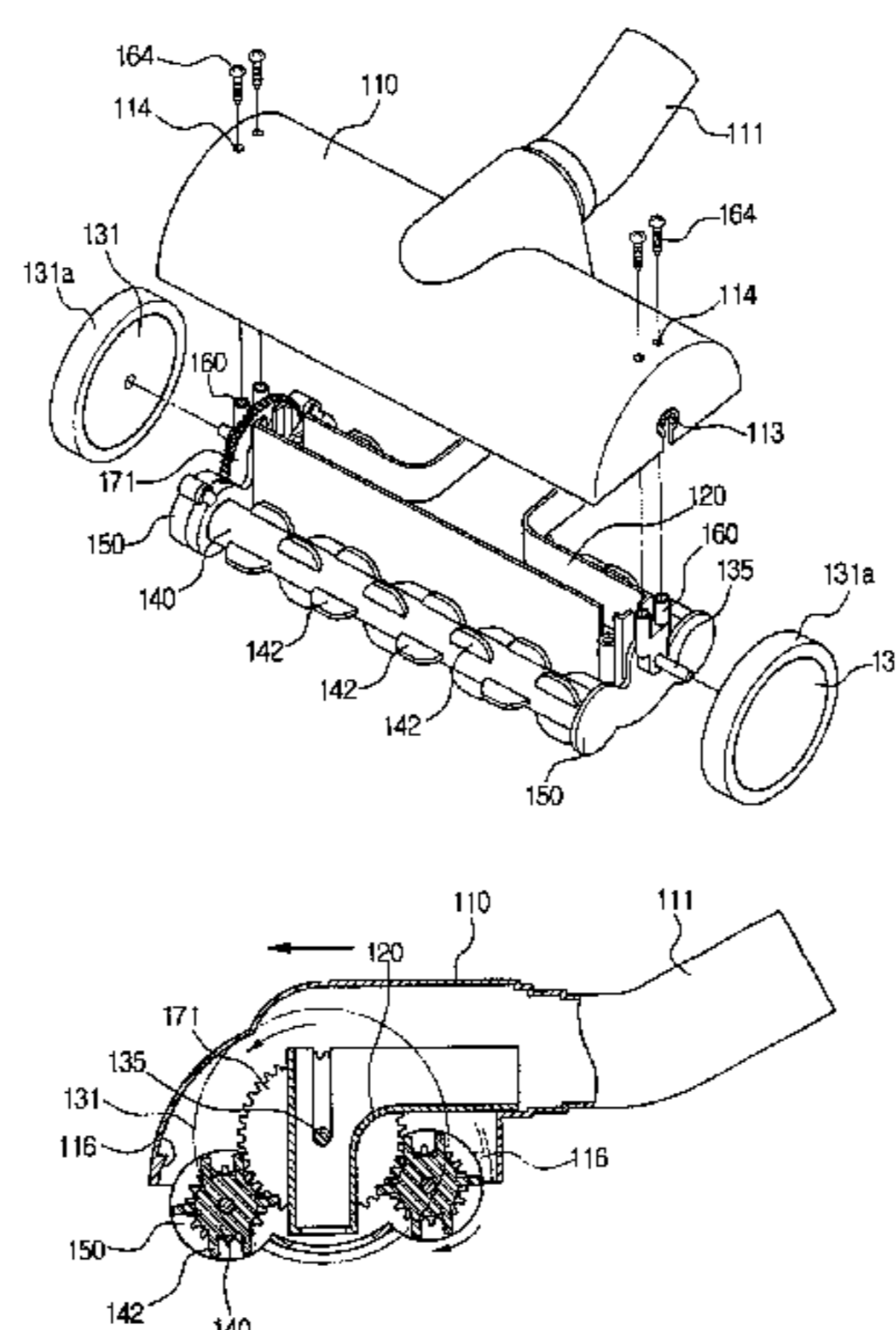
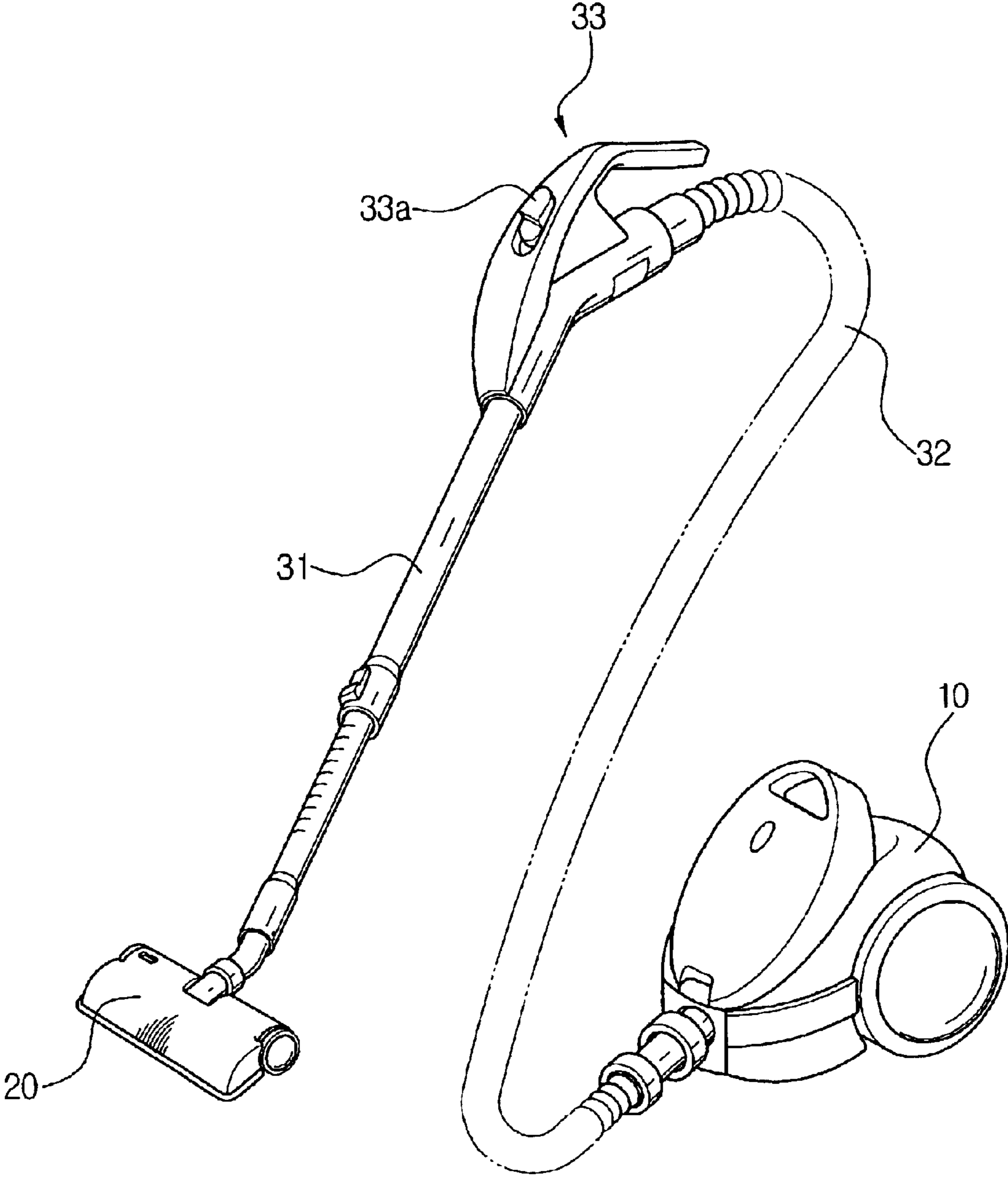


FIG. 1



(PRIOR ART)

FIG. 2

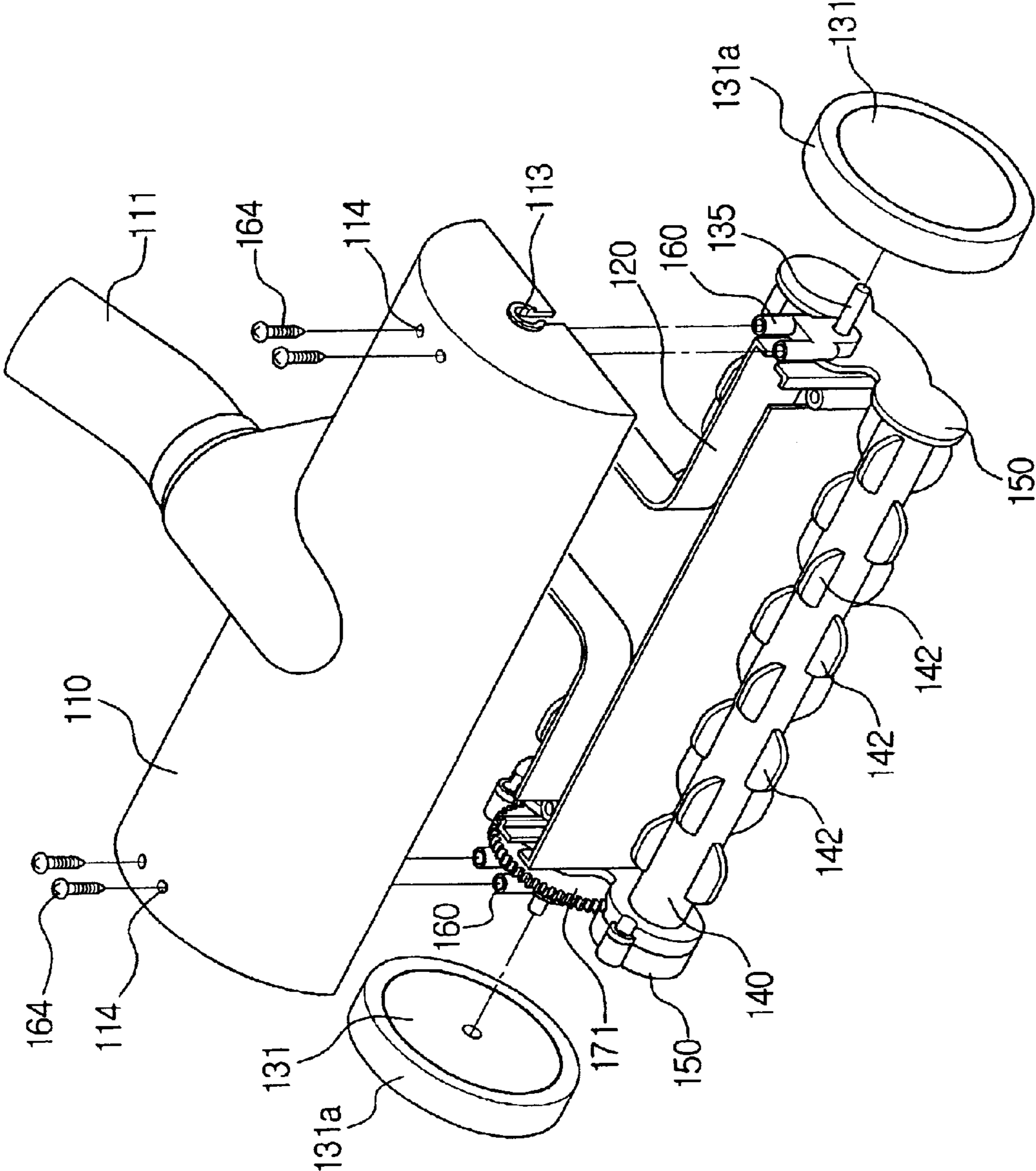


FIG. 3

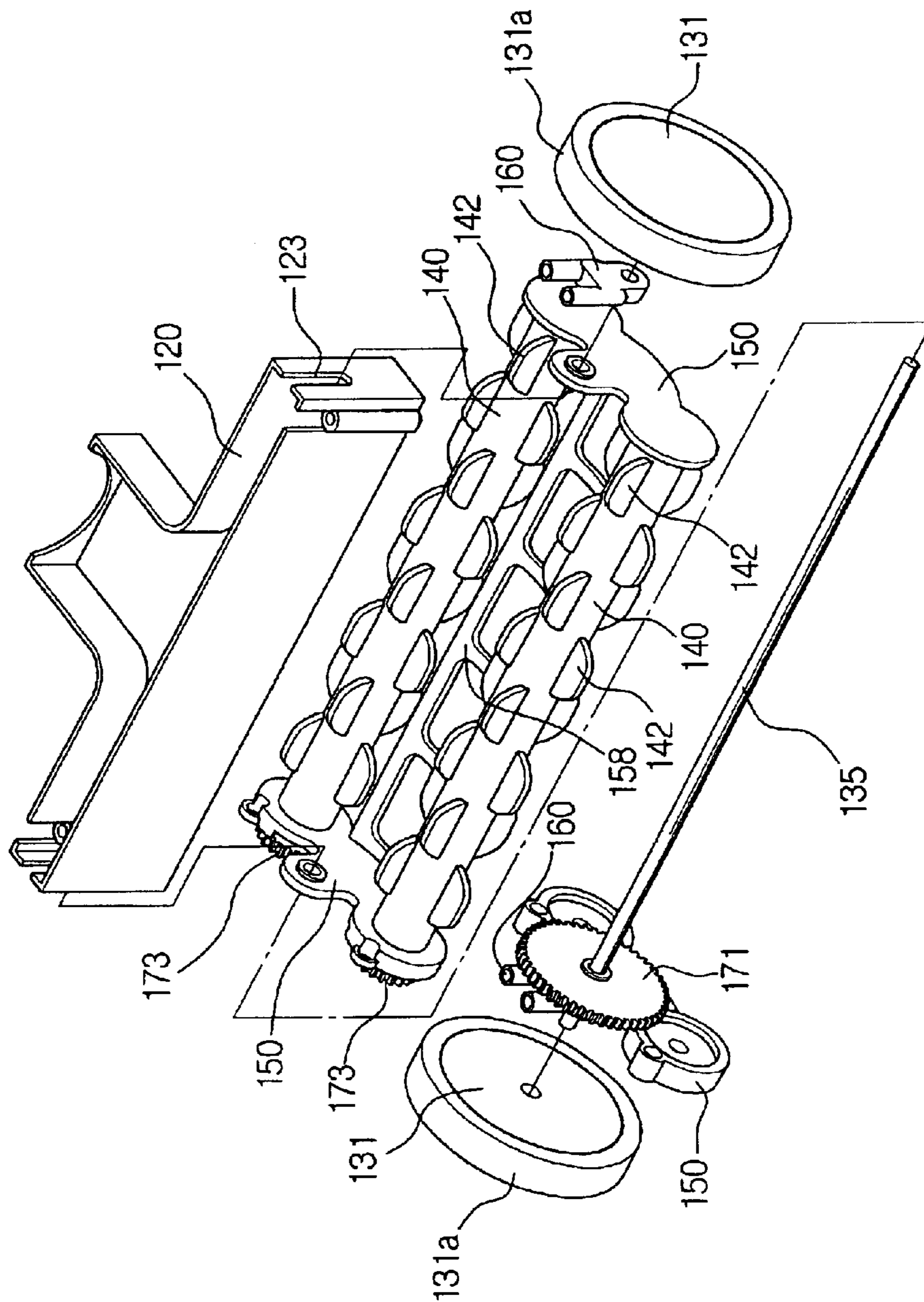


FIG. 4

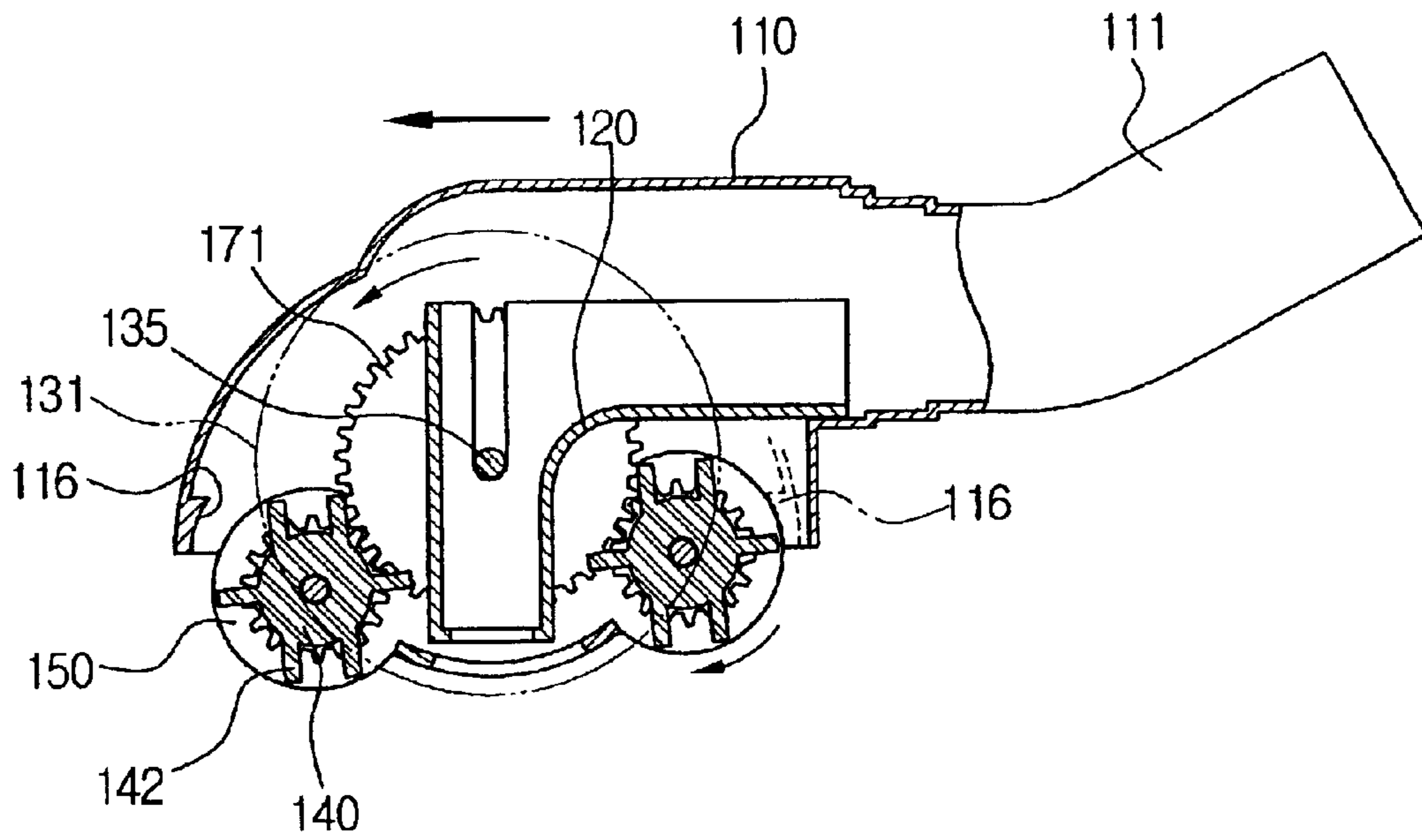
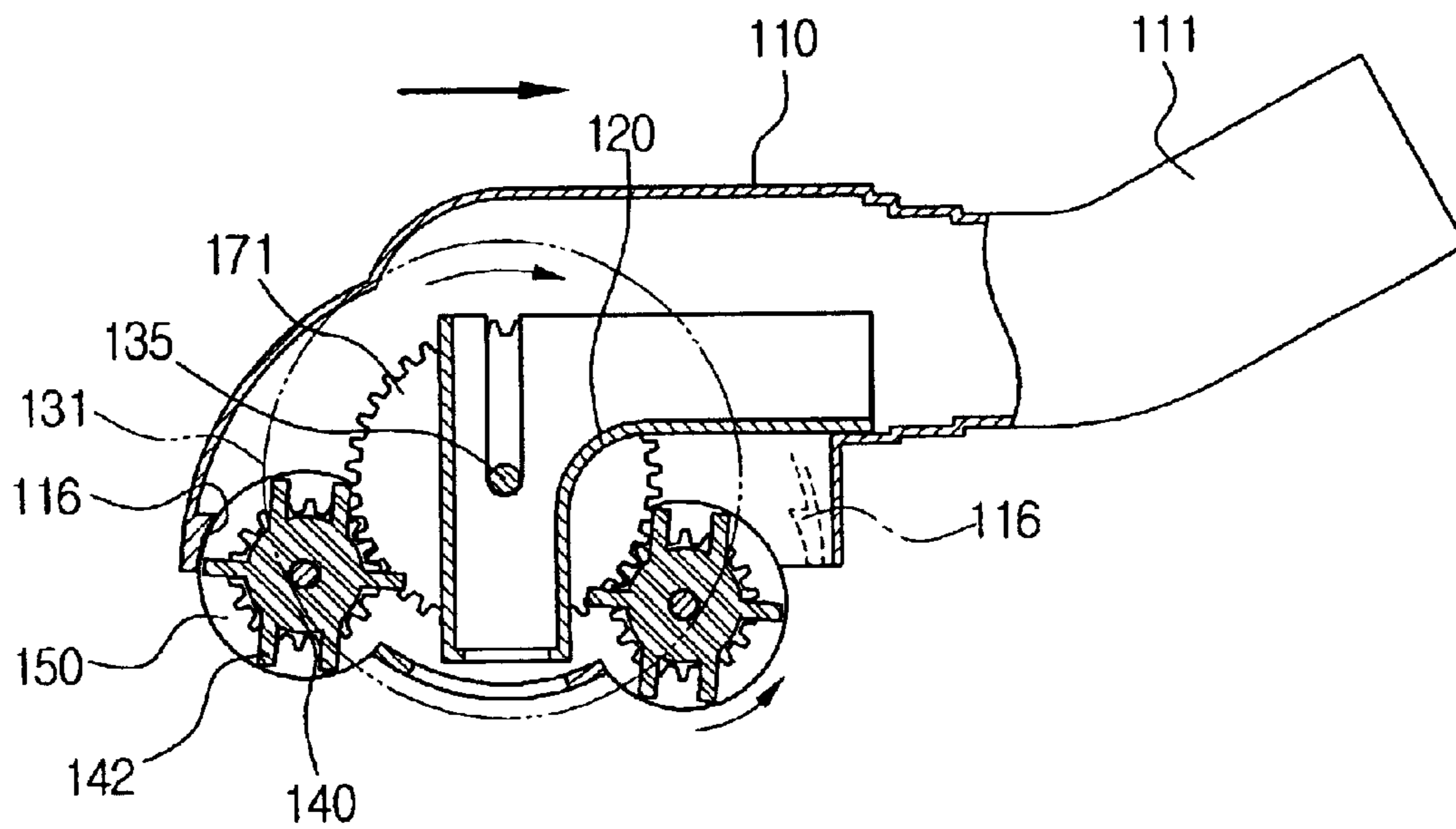


FIG. 5



SUCTION BRUSH ASSEMBLY HAVING ROTATION ROLLER FOR SWEEPING DUST

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a vacuum cleaner, and more particularly, to a suction brush assembly having a rotation roller for sweeping dust from bedclothes and etc., and a vacuum cleaner having the same.

2. Description of the Prior Art

FIG. 1 is a view showing the appearance of a conventional vacuum cleaner. The conventional vacuum cleaner has a body **10** having a driving device such as a motor, a connection hose **32** connected with the body **10**, a handle **33** disposed at the end of the connection hose **32**, an extension pipe **31** disposed at the handle **33**, and a brush **20** disposed at the end of the extension pipe **31**. When a user drives the vacuum cleaner by manipulating a switch **33a** disposed at the handle **33**, the vacuum cleaner conducts a suction operation as the motor in the body **10** is driven. Accordingly, dust is drawn into the vacuum cleaner through a suction port formed at the bottom of the brush **20**. The drawn dust is collected in a dust-collecting chamber (not shown) in the body **10** through the connection hose **32** connected with the extension pipe **31**.

Generally, the above brush **20** is used when the user cleans the floor, but sometimes there is a difficulty in applying the brush **20** depending on the condition of the surface. Therefore, the brush **20** is manufactured to be able to separate from the extension pipe **31**, allowing the user to install another type of brush.

The brush can be one for cleaning fabrics, such as bedclothes, and carpets. The brush for cleaning fabrics may have a rotation roller rotated by friction force with the fabrics when the brush moves on the fabrics. A plurality of protrusions are formed on the outer circumference of the rotation roller. Therefore, when the rotation roller is rotated, the protrusions hit the fabrics. This results in the dust on the fabrics getting off from the fabrics, and the fallen dust being drawn through the brush. Thus, the effect for removing dust increases.

However, since the rotation roller is simply rotated by the friction force with the fabrics in the conventional brush for fabrics, there is a problem in that the rotation roller cannot be easily rotated. In that case, the cleaning efficiency can be weak or even non-existent.

Moreover, the rotation of the rotation roller is substantially generated as the protrusions formed on the rotation roller are caught by the fabrics. In other words, the rotation roller is rotated as one of the protrusions is caught at the fabrics while the brush is moving on the fabrics, and thus, other protrusions hit the fabrics. Accordingly, all of the protrusions hit the fabrics, resulting in a weakened hitting efficiency.

SUMMARY OF THE INVENTION

The present invention has been made to overcome the above-mentioned problems of the prior art. Accordingly, it is an object of the present invention to provide a suction assembly of a vacuum cleaner enabling a user to clean fabrics more efficiently as the effect of removing dust on the fabrics increases.

A suction brush assembly of a vacuum cleaner according to the present invention to accomplish the above object

comprises: a housing having a suction duct to provide a suction passage for dust; a rotation member rotatably disposed close to a suction port of the suction duct and having at least one protrusion formed on an outer circumference thereof; at least one wheel disposed at the housing; and a power transmission unit to rotate the rotation member by transmitting a rotation force of the wheel to the rotation member when the wheel is rotating.

It is preferable that the wheel and the rotation member are rotated in directions opposite to each other by the power transmission unit. The power transmission unit includes: a driving gear rotated together with the wheel; and a driven gear rotated by the driving gear together with the rotation member.

A pair of rotation members are disposed respectively at both sides of the suction port, and the pair of rotation members are relatively fixed by the settlement member.

It is preferable that the rotation member has a shape of a roller parallel to a rotation axis of the wheel, and the protrusion has a shape of a rib disposed along the longitudinal direction of the rotation member.

A friction member such as a rubber strip is disposed at the outer circumference of the wheel so that the rotation of the wheel can be secured.

The rotation member can move within a predetermined range so that the height thereof can be changed.

According to the present invention, when the user wants to clean fabrics such as bedclothes or a carpet, the effect of hitting is firmly secured, thus the effect of removing dust remarkably increases.

Also, according to the present invention, a vacuum cleaner having the above suction brush assembly is provided.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned object and the feature of the present invention will be more apparent by describing the preferred embodiment of the present invention by referring to the appended drawings, in which:

FIG. 1 is a perspective view showing a conventional vacuum cleaner;

FIGS. 2 and 3 are exploded perspective views showing a suction brush assembly according to the present invention; and

FIGS. 4 and 5 are partial views showing the status of usage of the suction brush assembly according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Hereinbelow, the preferred embodiment of the present invention will be described in greater detail by referring to the appended drawings. In the drawings, the same reference numbers represent the same or similar elements in the different drawings whenever possible. In the description of the present invention, the description of each part of a conventional vacuum cleaner as shown in FIG. 1 will be omitted.

FIGS. 2 and 3 are exploded perspective views showing a suction brush assembly according to the present invention. The suction brush assembly has a housing **110** connected with an extension pipe (not shown) of the vacuum cleaner, a pair of rotation rollers **140** disposed at a lower part of the housing **110**, and a pair of wheels **131** disposed at both sides of the housing **110**.

The housing **110** has a connection pipe **111** connected with the extension pipe of the vacuum cleaner. A duct member **120** is installed at the lower part of the housing **110**. The duct member **120** and the housing **110** form a suction duct to provide a suction passage for drawing dust when the vacuum cleaner operates.

The rotation rollers **140** are rotatably installed at both sides of a suction port at the position close to the suction port of the suction duct. At this time, it is preferable that the rotation rollers **140** are disposed to allow its rotation axis to be parallel to a rotation shaft **135** described later. Moreover, the installation positions of a pair of rotation rollers **140** are forward and backward of advancing direction of the suction brush when the suction brush is used for cleaning. In the preferred embodiment of the present invention, the rotation rollers **140** have been exemplified, but it is not limited to the shape of roller and another type of rotation member rotatably disposed at the housing **110** can be applied.

A plurality of ribs **142** are formed at the outer circumference of the rotation rollers **140**. The ribs **142** are disposed by a predetermined distance in a longitudinal direction of the rotation rollers **140**. In addition, the ribs **142** are disposed at different positions on a rotational direction of the rotation rollers **140**. Accordingly, the ribs **142** form a plurality of rows. In the preferred embodiment of the present invention, the example that the ribs **142** are formed has been described, but another type of protrusions other than the ribs **142** can be formed.

The pair of rotation rollers **140** are relatively settled by settlement members **150**. The settlement members **150** are connected to both ends of the rotation rollers **140**. In this situation, the settlement members **150** are connected to the rotation rollers **140** to allow the rotation rollers **140** to be rotated.

The rotation shaft **135** is penetrating the settlement members **150**. Thus, the rotation shaft **135** is rotatably supported by the settlement members **150**.

Connection members **160** are connected with the both ends of the rotation shaft **135**. Thus, the settlement member **140** is rotatably connected with the connection members **160**. Several screws **164** penetrating connection holes **114** formed at the housing **110** are connected with the connection members **160**. Accordingly, the connection members **160** are firmly fixed at the housing **110**, and the settlement member **150** and the rotation rollers **140** connected with the settlement member **150** can be rotated within a predetermined range with respect to the housing **110**.

FIG. **3** shows a suction grill **158** disposed close to the suction port of the suction duct and formed at the bottom of the settlement member **140**. The suction grill **158** can be formed integrally with the settlement member **140** or can be formed separately with the settlement member **140**.

Recesses **113** are formed at both sides of the housing **110** (see FIG. **2**). The rotation shaft **135** is embraced in the recesses **113** when the housing **110** is connected to the duct member **120**. Accordingly, the rotation shaft **135** takes a shape of substantially penetrating the housing **110**.

Two wheels **131** are installed at both ends of the rotation shaft **130**. The wheels **131** are contacted with the floor when the suction brush assembly is placed on the floor. Thus, a user can clean the floor by moving the suction brush assembly. Friction members **131a** for easier rotation by increasing the friction force with the floor are installed at the outer side of the wheels **131**. A preferable example of the friction members **131a** is a rubber strip encircling the entire outer circumference of the wheels **131**.

The rotation force of the wheels **131** is transferred to the rotation rollers **140** by a power transmission unit. The power transmission unit includes a driving gear **171** rotated by the rotation shaft **135** and a driven gear **173** disposed at the rotation rollers **140**. The driving gear **171** is installed at one part of the rotation shaft **135** and rotated together with the rotation shaft **135**. The driven gear **173** is engaged with the driving gear **171** and rotated together with the rotation rollers **140**. The driven gear **140** can be integrally formed with the rotation rollers **140**. The wheels **131** and the rotation rollers **140** are rotated in directions opposite to each other by the power transmission unit.

Hereinbelow, the operation of the suction brush assembly of the vacuum cleaner according to the present invention having the above structure will be described referring to FIGS. **4** and **5**.

When the user moves the suction brush assembly forwardly, the wheels **131** are rotated in a counterclockwise direction and the rotation rollers **140** are rotated in a clockwise direction by the rotation of the driving gear **171** and the driven gear **173** as shown in FIG. **4**. Accordingly, the bedclothes or the carpet under the suction brush assembly is hit by the ribs **142** formed at the rotation rollers **140**. Therefore, dust on the bedclothes or the carpet falls and the fallen dust is drawn through the suction duct formed by the housing **110** and the duct member **120**. At this time, the suction grill **158** prevents the bedclothes from being drawn into the suction duct.

When the user moves the suction brush assembly backwardly, the wheels **131** are rotated in the clockwise direction and the rotation rollers **140** are rotated in the counterclockwise direction by the rotation of the driving gear **171** and the driven gear **173** as shown in FIG. **5**.

When the rotation rollers **140** are rotated by the movement of the suction brush assembly, the rotation rollers **140** are rotated not by the friction force with the bedclothes on the floor but by the rotation force of the wheels **131**. Moreover, the rotation of the wheels **131** is secured by the friction members **131a** installed at the wheels **131**. Therefore, the rotation rollers **140** are always rotated, thus the effect of hitting the bedclothes is maintained all the time.

In addition, as the rotation rollers **140** are rotated in direction opposite to the advancing direction of the suction brush assembly due to the structure of the power transmission unit, all of the ribs **142** of the rotation rollers **140** hit the bedclothes. Additionally, the ribs **142** hit the bedclothes at a speed which is the addition of the advancing speed of the suction brush assembly and the rotation speed of the rotation rollers **140**, and thus, the effect of the hitting is remarkably increased.

On the other hand, as the entire duct member **120** is rotatable within a predetermined range with respect to the housing **110** as described before, the settlement member **150** fixed for the duct member **120** and the rotation rollers **140** are sloped by the friction force in accordance with the movement of the suction brush assembly. In other words, when the suction brush assembly advances forwardly, the rotation roller **140** placed in the front moves downwardly and the rotation roller **140** placed in the rear moves upwardly as shown in FIG. **4**. Moreover, when the suction brush assembly moves backwardly, the rotation roller **140** placed in the front moves upwardly, and the rotation roller **140** placed in the rear moves downwardly as shown in FIG. **5**.

In the present invention, the rotation rollers **140** are rotated by the wheels **131**, thus the height of the bottom of the rotation rollers **140** should be higher than that of the

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wheels **131**. In that case, the effect of hitting can be reduced due to the distance between the rotation rollers **140** and the bedclothes. Therefore, the rotation rollers **140** should be sloped with respect to the advancing direction so that the rotation rollers **140** are firmly contacted with the bedclothes and the effect of the hitting can be secured. Especially, as shown in FIGS. **4** and **5**, the rotation rollers **140** are placed in the front so that they hit the bedclothes, thus, the bedclothes are firstly hit and the dust is drawn later.

Hooking protrusions **116** are formed in the front inner side and the rear inner side of the housing **110**. As shown in FIGS. **4** and **5**, the hooking protrusions **116** are caught at one part of the settlement member **150** when the rotation rollers **140** are rotated. Therefore, the angle of the rotation rollers **140** being sloped may be limited within a predetermined range due to the hooking protrusions **116**. Accordingly, as the movement range of the rotation rollers **140** is limited, the user can use the vacuum cleaner more conveniently.

As described so far, according to the present invention, as the rotation rollers **140** are rotated by the wheels **131** in the direction opposite to that of the wheels **131**, the effect of the hitting of the rotation rollers **140** increases. Therefore, when the user wants to clean the bedclothes or the carpet, the effect of removing dust increases as well.

Although the preferred embodiment of the present invention has been described, it will be understood by those skilled in the art that the present invention should not be limited to the described preferred embodiment, but various changes and modifications can be made within the spirit and the scope of the present invention. Accordingly, the scope of the present invention is not limited to the described embodiments.

What is claimed is:

1. A suction brush assembly of a vacuum cleaner comprising:

a housing having a suction duct to provide a suction passage for dust;
a pair of rotation members rotatably disposed close to both sides of a suction port, respectively, of the suction duct and having at least one protrusion formed on an outer circumference thereof;

at least one wheel disposed at the housing;

a power transmission unit to rotate the rotation members by exerting a rotation force of the wheel to the rotation members when the wheel is rotating; and

a settlement member to relatively fix the pair of rotation members.

2. The suction brush assembly of the vacuum cleaner of claim **1**, wherein

the wheel and the rotation member are rotated in directions opposite to each other by the power transmission unit.

3. The suction brush assembly of the vacuum cleaner of claim **1**, wherein the transmission unit includes:

a driving gear rotated together with the wheel; and
a driven gear rotated by the driving gear together with the rotation member.

4. The suction brush assembly of the vacuum cleaner of claim **3**, further comprising

a rotation shaft disposed at the housing and having the wheel, wherein the driving gear is disposed at a part of the rotation shaft.

5. The suction brush assembly of the vacuum cleaner of claim **1**, wherein

the settlement member has a suction grill disposed close to the suction port.

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6. The suction brush assembly of the vacuum cleaner of claim **1**, wherein

the rotation member has a shape of a roller parallel to a rotation axis of the wheel.

7. The suction brush assembly of the vacuum cleaner of claim **6**, wherein

the protrusion has a shape of a rib disposed along a longitudinal direction of the rotation member.

8. The suction brush assembly of the vacuum cleaner of claim **7**, wherein

a plurality of ribs are disposed at a different place in a rotating direction of the rotation member.

9. The suction brush assembly of the vacuum cleaner of claim **1**, further comprising

a friction member disposed at an outer circumference of the wheel.

10. The suction brush assembly of the vacuum cleaner of claim **9**, wherein

the friction member is a rubber strip encircling the outer circumference of the wheel.

11. The suction brush assembly of the vacuum cleaner of claim **1**, wherein

the rotation member can move within a predetermined range so that the height thereof can be changed.

12. The suction brush assembly of the vacuum cleaner of claim **11**, further comprising

a means for limiting the movement of range of the rotation member.

13. The suction brush assembly of the vacuum cleaner of claim **12**, wherein

the means for limiting is a hooking protrusion formed on an inner side of the housing.

14. A vacuum cleaner comprising a suction brush having a construction described in claim **1**.

15. A suction brush assembly of a vacuum cleaner, comprising:

a housing having a suction duct to provide a suction passage for dust;

a rotation member rotatably disposed close to a suction port of the suction duct and having at least one protrusion formed on an outer circumference thereof, the rotation member having a shape of a roller parallel to a rotation axis of the wheel and the protrusion having a shape of a rib disposed along a longitudinal direction of the rotation member;

at least one wheel disposed at the housing; and

a power transmission unit to rotate the rotation member by exerting a rotation force of the wheel to the rotation member when the wheel is rotating.

16. The suction brush assembly of claim **15**, wherein a plurality of ribs are disposed at a different place in a rotating direction of the rotation member.

17. The suction brush assembly of claim **15**, further comprising

a friction member disposed at an outer circumference of the wheel.

18. The suction brush assembly of claim **15**, wherein the friction member is a rubber strip encircling the outer circumference of the wheel.

19. The suction brush assembly of claim **15**, wherein the rotation member can move within a predetermined range so that the height thereof can be changed.

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20. The suction brush assembly of claim 15, further comprising

a means for limiting the movement of range of the rotation member.

21. The suction brush assembly of claim 20, wherein the means for limiting is a hooking protrusion formed on an inner side of the housing.

22. A suction brush assembly of a vacuum cleaner, comprising:

a housing having a suction duct to provide a suction passage for dust;

a rotation member rotatably disposed close to a suction port of the suction duct and having at least one protrusion formed on an outer circumference thereof;

at least one wheel disposed at the housing;

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a power transmission unit to rotate the rotation member by exerting a rotation force of the wheel to the rotation member when the wheel is rotating; and

the rotation member can move within a predetermined range so that the height thereof can be changed.

23. The suction brush assembly of claim 22, further comprising

a means for limiting the movement of range of the rotation member.

24. The suction brush assembly of claim 22, wherein the means for limiting is a hooking protrusion formed on an inner side of the housing.

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